

FORM PTO-1300 (Modified)  
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

## TRANSMITTAL LETTER TO THE UNITED STATES

R.35636

DESIGNATED/ELECTED OFFICE (DO/EO/US)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)

CONCERNING A FILING UNDER 35 U.S.C. 371

09/719469

INTERNATIONAL APPLICATION NO.

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/DE 00/00685

03 March 2000

15 April 1999

## TITLE OF INVENTION

**Method For Mounting A Worm On An Armature Shaft Of An Armature Of An Electric Motor,  
And Armature Produced By The Method**

APPLICANT(S) FOR DO/EO/US

FAUTH, Lothar

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

## Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Transmittal Sheets in duplicate w/fees charged to Dep. Acct. 07-2100  
 Copy of German Text Application w/2 sheets drawings  
 Translation of German Text Application w/2 sheets drawings  
 Preliminary Amendment  
 Copy of PCT/RO/101, PCT/ISA/210 and 220  
 Executed Declaration (not enclosed)  
 Assignment to Robert Bosch GmbH (not enclosed)



## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Lothar Fauth

Based on PCT/DE 00/00685

For: Method For Mounting A Worm On An Armature Shaft Of An Armature Of An  
Electric Motor, And Armature Produced By The Method

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as  
follows:

IN THE TITLE

Please change the title to read as follows:

--METHOD FOR PROVIDING A WORM ON AN ARMATURE SHAFT OF AN  
ELECTRIC MOTOR, AND ARMATURE PRODUCED BY THE METHOD--.

IN THE SPECIFICATION

Page 1, between the title and first line of the specification, insert the following:

--Cross-Reference to Related Applications

This is a 35 USC 371 application of PCT/DE 00/00685 filed on March 3,  
2000.--.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Lothar Fauth

Based on PCT/DE 00/00685

For: Method For Mounting A Worm On An Armature Shaft Of An Armature Of An  
Electric Motor, And Armature Produced By The Method

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IN THE TITLE

Please change the title to read as follows:

--METHOD FOR PROVIDING A WORM ON AN ARMATURE SHAFT OF AN  
ELECTRIC MOTOR, AND ARMATURE PRODUCED BY THE METHOD--.

IN THE SPECIFICATION

Page 1, between the title and first line of the specification, insert the following:

--Cross-Reference to Related Applications

This is a 35 USC 371 application of PCT/DE 00/00685 filed on March 3,  
2000.--.

line 16, delete "are" and insert --can be--;

line 17, after "packet" insert --after it is--.

Page 2, lines 8 and 9, delete "having the characteristics of claim 1,".

Page 3, delete lines 7-9;

line 10, delete "The" and insert --According to one aspect of the invention, the-- and after "rolling" change ", " into --.--;

delete line 11;

line 12, delete "claim 3," and insert --another aspect of the invention,--;

line 13, delete "is" and insert --can be--.

Page 4, line 9, delete "claim 4" and insert --another aspect of the invention--;

line 11, delete "is" and insert --can be--;

line 20, delete "Drawing" and insert --Brief Description of the Drawings--;

lines 22 and 23, delete "The two drawing figures show two armatures" and start a new paragraph inserting --Figures 1 and 2 each show an armature--.

Page 5, line 8, delete "10" and insert --14--;

line 10, after "armature" insert --shaft--.

Page 7, after line 3, insert the following paragraph:

--The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.--.

## IN THE CLAIMS

Page 8, line 1, delete "Claims" and insert --I Claim--.

Please cancel claims 1-7 and add new claims 8-14.

8. An armature for providing a worm on an armature shaft of an armature of an electric motor, wherein that the worm (30) is produced, at the end of the armature assembly (10), by reshaping the armature shaft (12).

9. The armature of claim 8, wherein that the worm (30) is produced by rolling.

10. The armature of claim 8, wherein that before the production of the worm (30), a tubular bearing seat (26) is mounted on the armature shaft (12) between other parts (14, 18, 20) of the armature (10), which are placed on the armature shaft (12), and the worm (30) to be produced, and an outer diameter of the bearing seat (26) is at least as great as an outer diameter of the worm (30) to be produced.

11. The armature of claim 8, wherein that before the worm (30) is produced, a shaft bearing (28) is mounted on the armature shaft (12) between other parts (14, 18, 20) of the armature (10), which are placed on the armature shaft (12), and the worm (30) to be produced.

12. An armature for an electric motor, having an armature shaft that has a worm which is integral with the armature shaft, wherein that the worm (30) has a greater outer diameter than does the armature shaft (12) over its remaining length.

13. The armature of claim 12, wherein that a tubular bearing seat (26), whose outer diameter is at least as great as an outer diameter of the worm (30), is mounted on the armature shaft (12) between the worm (30) and other parts (14, 18, 20) of the armature (10) that are placed on the armature shaft (12).

14. The armature of claim 12, wherein that a shaft bearing (28) is mounted directly on the armature shaft (12), between the worm (30) and other parts (14, 18, 20) of the armature (10) that are placed on the armature shaft (12).

IN THE ABSTRACT

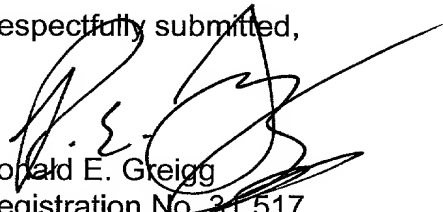
Please substitute the attached Abstract of the Disclosure for the abstract as originally filed.

REMARKS

The above amendments are being made to place the application in better condition for examination.

Entry of the amendment is respectfully solicited.

Respectfully submitted,



Ronald E. Greigg  
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Attorney for Applicant

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## ABSTRACT OF THE DISCLOSURE

The invention relates to a method for mounting a worm on an armature shaft of an armature for an electric motor. The invention proposes first mounting armature parts, such as an armature lamination packet with armature windings, a commutator, a bearing seat, and/or a bearing, on the armature shaft and then rolling the worm on the armature shaft. This has the advantage that the worm can have a greater diameter than does the armature shaft over its remaining length.

METHOD FOR MOUNTING A WORM ON AN ARMATURE SHAFT OF AN  
ARMATURE OF AN ELECTRIC MOTOR, AND ARMATURE  
PRODUCED BY THE METHOD  
SPECIFICATION

5 Prior Art

The invention relates to a method for mounting a worm on an armature shaft of an armature of an electric motor, and to an armature produced by the method.

10 It is known to produce a worm by reshaping, in particular by rolling an armature shaft of an electric motor in one piece with the armature shaft. Next, the armature is assembled from its individual parts; that is, for instance an armature lamination packet, a commutator and a bearing are placed on the armature shaft. The armature lamination packet can already be provided with armature windings when it is placed on the armature shaft, or the armature windings are wound onto the armature lamination packet placed on the armature shaft. To enable placing the individual parts of the armature onto the armature shaft, an outer diameter of the worm produced by reshaping on the armature shaft must not be any greater than a diameter of the armature shaft over the remaining length of the armature shaft. This has the disadvantage that an armature shaft of large diameter is necessary, or the worm must have a small diameter, and this limits a load-bearing force and thread pitch of the worm.

20

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Another possibility is to produce the worm as a separate part, place it on the armature shaft, and connect it to the armature shaft in a manner fixed against relative rotation. This has the disadvantage of greater effort and expense, and there can be misalignment between the armature shaft and the worm.

#### Advantages of the Invention

In the method according to the invention having the characteristics of claim 1, first the armature is assembled from its individual parts; that is, the armature lamination packet, commutator and sliding and/or roller bearings are for instance placed in the armature shaft, and next the worm is produced by reshaping of the armature shaft. In this way, it is possible to produce the worm with a larger diameter than the remaining armature shaft, since the individual parts of the armature do not have to be placed on the armature shaft past the worm. For the reshaping, the armature shaft can be received at its bearings or bearing points. The invention has the advantage that a simple, economical armature shaft without graduations can be used; that is, the armature shaft can be produced from a bar with no change in cross section whatever over its entire length, for instance economical rod material. The invention also makes a small diameter of the armature shaft possible, thus reducing both the structural size and weight of the armature and thus the structural size and weight of the entire electric motor. Because of the reduced weight

and the reduced diameter of the armature, its moment of rotational inertia is reduced, thus improving the starting performance of the electric motor. Because of its greater core diameter, the worm produced according to the invention has greater strength. Because of the integral production of the worm with the armature shaft, any misalignment is slight.

The subject of the dependent claims is advantageous refinements and features of the invention defined by the main claim.

The worm is preferably produced by rolling, in accordance with claim 2.

According to claim 3, before the worm is produced, a tubular bearing seat is mounted between armature parts placed on the armature shaft, that is, for instance, the armature lamination packet and the commutator, and the worm that is yet to be produced. The tubular bearing seat can for instance be press-fitted or shrunk onto the armature shaft, the latter meaning that the bearing seat is heated and thereby increased in diameter and is consequently slipped smoothly onto the armature shaft, on which, after cooling down, it is seated nondisplaceably and in a manner fixed against relative rotation. As a result of the bearing seat, it is possible to increase the diameter of the armature shaft in the region of the bearing to at least the outer diameter of the worm, without having to use a graduated armature shaft for the

purpose. The greater diameter at the bearing seat of the armature shaft makes it possible to mount a shaft bearing, after the worm has been produced by reshaping. This has the advantage that a coolant lubricant used in shaping the worm, or dirt particles produced in shaping the worm, do not get into the shaft bearing, and that the armature, after the shaping of the worm, can be cleaned without problems, for instance even with a rinsing solution.

According to claim 4, the bearing, disposed between the armature lamination packet and the commutator on the one hand and the worm on the other, is placed directly on the armature shaft, without any separate bearing seat and before the shaping of the worm. This has the advantage of dispensing with a separate bearing seat and its assembly, and has the advantage that all the parts to be placed on the armature shaft are placed on the armature shaft before the shaping of the worm. The production of the armature ends with the shaping of the worm, and the bearing does not have to be placed on the shaft later as well.

Drawing

The invention is described below in further detail in terms of two exemplary embodiments shown in the drawing. The two drawing figures show two armatures, produced according to the invention, in half section.

## Description of the Exemplary Embodiment

The armature 10 shown in Fig. 1 and produced according to the invention has an armature shaft 12, which is made from a cylindrical material that has no changes in diameter or cross section over its length. For instance, the armature shaft 12 can be cut from cylindrical rod material. According to the invention, individual parts of the armature 10, which in the exemplary embodiment shown are a commutator 10 and an armature lamination packet 18 spray-coated with plastic 16, are placed in a manner fixed against relative rotation on the armature 12. The armature lamination packet 18 has armature windings 20, which are wound onto the armature lamination packet 18 either before or after the armature lamination packet 18 is placed on the armature shaft 12. Ends 22 of the armature windings 20 are contacted at the commutator 14 in a manner known per se.

On the side of the armature lamination packet 18 remote from the commutator 14, the armature shaft 12 protrudes a short way out of the armature lamination packet 18 and the armature windings 20. This end of the armature shaft 12 forms a bearing seat 24 for a slide bearing, not shown. On the other side, the armature shaft 12 protrudes by a greater distance from the commutator 14. On this side, a tubular bearing seat 26 for a roller bearing 28 or a slide bearing, not shown, is pressed or shrunk onto the armature shaft 12 axially nondisplaceably and in a manner fixed against relative

rotation. After the mounting of the commutator 14, the armature lamination packet 18 with the armature windings 20, and the bearing seat 26 on the armature shaft 12, the end of the armature shaft protruding from the bearing seat 26 is  
5 shaped by rolling into a worm 30. In the rolling of the worm 30, the armature 10 can be supported on both of its bearing seats 24, 26. The worm 30 has a greater outer diameter than the armature shaft 12 over its remaining length outside the worm 30. Because of the shaping of the worm 30 after the  
10 mounting of the armature lamination packet 18 with the armature windings 20 and the commutator 14 on the armature shaft 12, the worm 30 can be produced with a greater diameter than the armature shaft 12 over its remaining length, since the aforementioned parts 18, 20, 14 of the armature 10 do not  
15 have to be slipped over the worm 30.

The bearing seat 26, placed on the armature shaft 12 between the commutator 14 and the worm 30, has at least as large an outer diameter as the worm 30, so that the ball bearing 28, or a slide bearing, not shown, can be placed on  
20 the bearing seat 26 after the rolling of the worm 30 and any optional cleaning of the armature.

In the case of the armature shown in Fig. 2, the bearing seat 26 disposed between the commutator 14 and the worm 30 is omitted; the ball bearing 28, or the slide bearing not shown,  
25 is placed on the armature shaft 12 directly and before the rolling of the worm 30. The ball bearing 28, or the slide

bearing not shown, can be used for supporting the armature 10 during the rolling of the worm 30. The ball or slide bearing 28 is covered if necessary for the rolling of the worm 30.



## CLAIMS

1. A method for mounting a worm on an armature shaft of an armature of an electric motor, characterized in that the worm (30) is produced, at the end of the assembly of the armature (10) from its individual parts (12, 14, 18, 20, 26), by reshaping for the armature shaft (12).

2. The method of claim 1, characterized in that the worm (30) is produced by rolling.

3. The method of claim 1, characterized in that before the production of the worm (30), a tubular bearing seat (26) is mounted on the armature shaft (12) between individual parts (14, 18, 20) of the armature (10), which are placed on the armature shaft (12), and the worm (30) to be produced, and an outer diameter of the bearing seat (26) is at least as great as an outer diameter of the worm (30) to be produced.

4. The method of claim 1, characterized in that before the worm (30) is produced, a shaft bearing (28) is mounted on the armature shaft (12) between individual parts (14, 18, 20) of the armature (10), which are placed on the armature shaft (12), and the worm (30) to be produced.

5. An armature for an electric motor, having an armature shaft that has a worm which is integral with the armature

shaft, characterized in that the worm (30) has a greater outer diameter than does the armature shaft (12) over its remaining length.

6. The method of claim 5, characterized in that a tubular bearing seat (26), whose outer diameter is at least as great as an outer diameter of the worm (30), is mounted on the armature shaft (12) between the worm (30) and individual parts (14, 18, 20) of the armature (10) that are placed on the armature shaft (12).

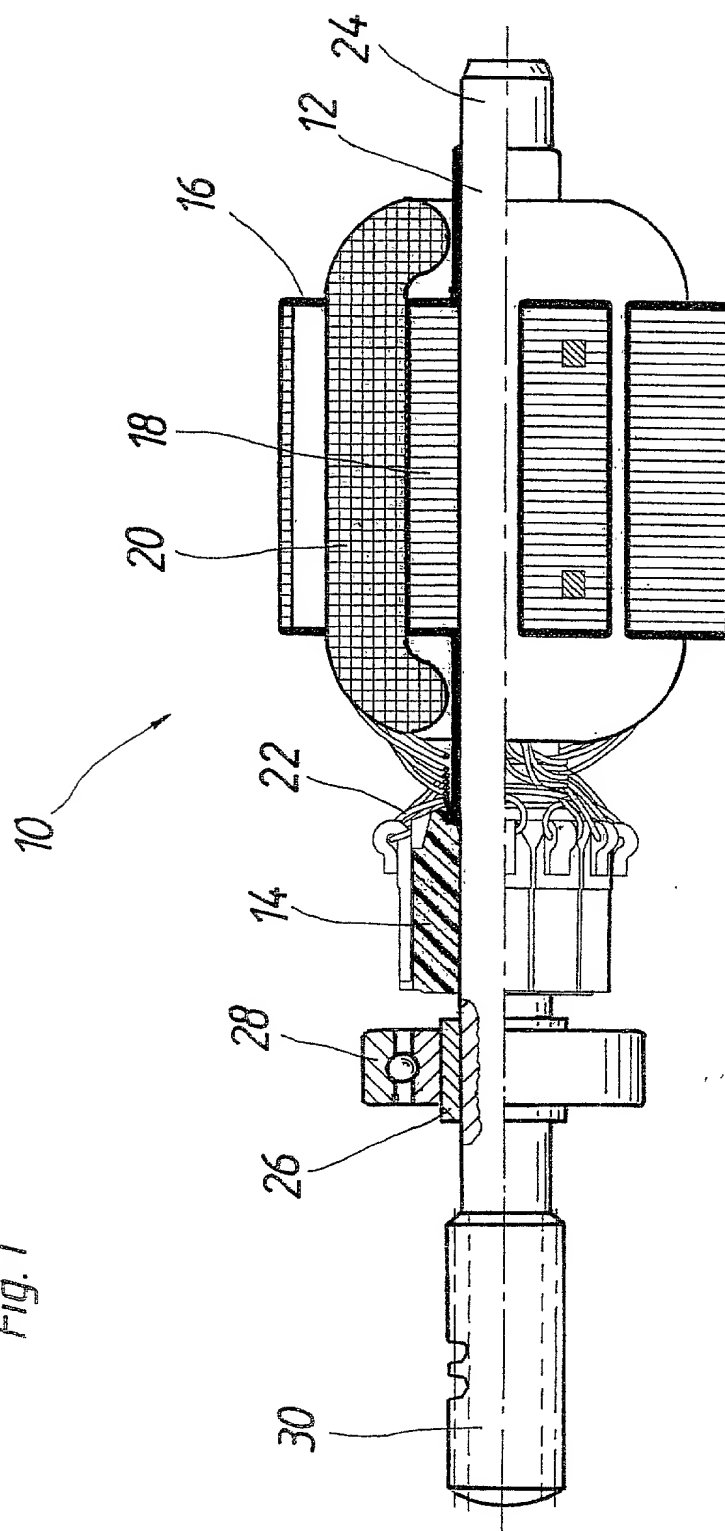
7. The method of claim 5, characterized in that a shaft bearing (28) is mounted directly on the armature shaft (12), between the worm (30) and individual parts (14, 18, 20) of the armature (10) that are placed on the armature shaft (12).

## Abstract

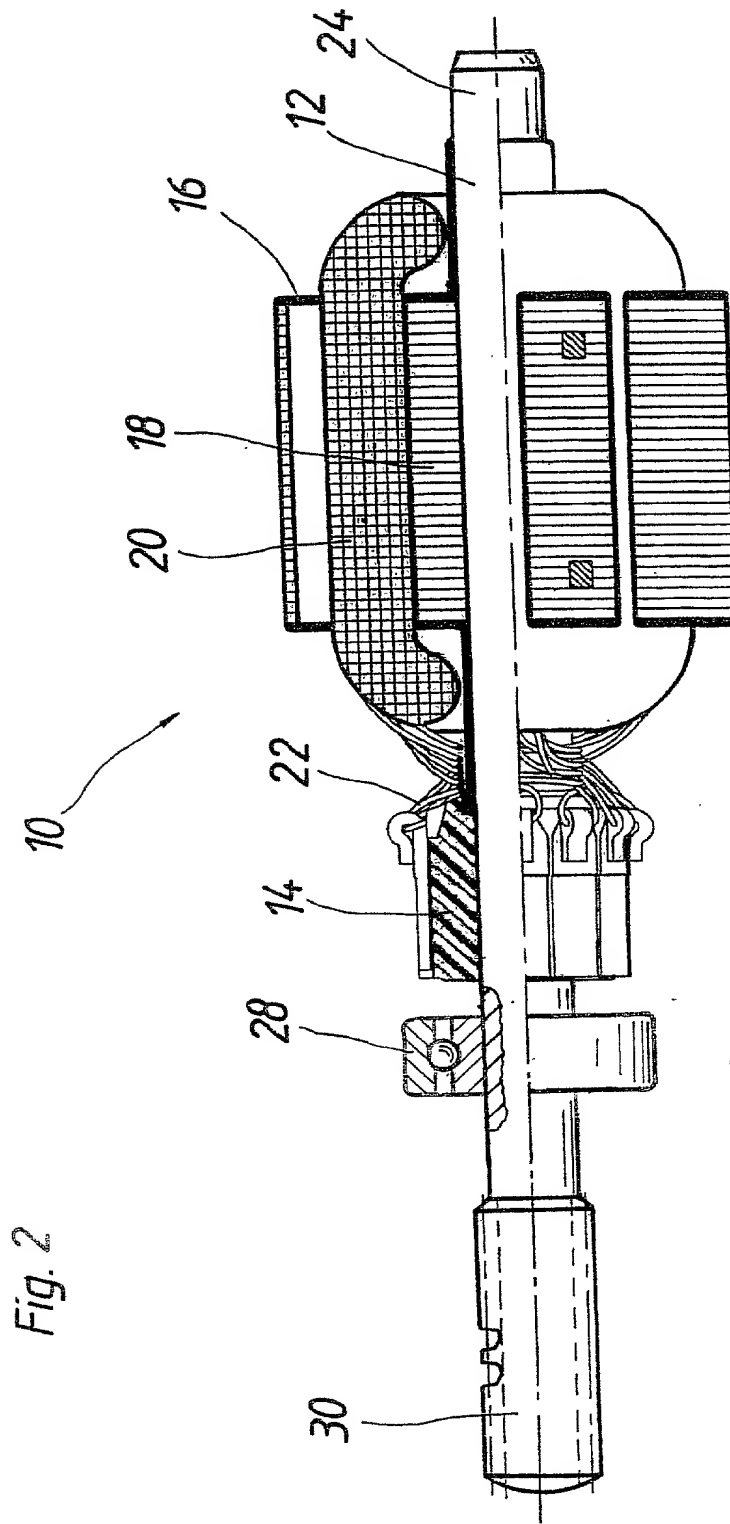
The invention relates to a method for mounting a worm (30) on an armature shaft (12) of an armature (10) for an electric motor. The invention proposes first mounting  
5 armature parts, such as an armature lamination packet (18) with armature windings (20), a commutator (14), a bearing seat (26), and/or a bearing (28), on the armature shaft (12) and then rolling the worm (30) on the armature shaft (12). This has the advantage that the worm (30) can have a greater  
10 diameter than does the armature shaft (12) over its remaining length. (Fig. 1)

1/2

Fig. 1



2/2



Docket No.  
R.35636

# Declaration and Power of Attorney For Patent Application

## English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

### METHOD FOR MOUNTING A WORM ON AN ARMATURE SHAFT OF AN ARMATURE OF AN ELECTRIC MOTOR, AND ARMATURE PRODUCED BY THE METHOD

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on 03 MARCH 2000 as United States Application No. or PCT International  
Application Number PCT/DE 00/00685  
and was amended on \_\_\_\_\_

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority	Not Claimed
<u>1 99 16 998.5</u>	<u>GERMANY</u>	<u>15 APRIL 1999</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)		
_____	_____	_____	<input type="checkbox"/>	
(Number)	(Country)	(Day/Month/Year Filed)		
_____	_____	_____	<input type="checkbox"/>	
(Number)	(Country)	(Day/Month/Year Filed)		

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Send Correspondence to

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**Ronald E. Greigg - (703) 838-5500/Telephone - (703) 838-5554/Facsimile**

Full name of sole or first inventor**Lothar FAUTH**

Sole or first inventor's signature

Date \_\_\_\_\_

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Second inventor's signature

Date \_\_\_\_\_

Residence

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